printed or written words. Learning problems that hinder a child's progress in particular subjects, such as arithmetic or spelling, are *specific learning disabilities.*

Diagnosis and Treatment. Not all learning and behavioral problems are caused by learning disabilities. Parents who suspect that their son or daughter may have a learning disability should have the child examined by a team of specialists. Many school districts provide such testing free or at a reasonable cost. Tests by a *pediatrician* (children's doctor), eye and ear specialists, a psychiatrist, and a social worker may find other possible causes of the problem. Such causes include emotional disturbances, mental retardation, and poor hearing and vision. If the test results are normal, a physician called a *neurologist* should examine the child for evidence of damage to the brain or nervous system. Then a psychologist should test each of the child's learning processes to determine which ones have been affected. Finally, a special-education teacher must measure the child's school achievement in order to learn in which subject areas he or she needs special help.

The method of treatment suggested by the teacher depends on the type and extent of the disability. Some learning-disabled children learn best in special classes with others who have similar problems. But many youngsters can do exercises to improve their weak skills in classes with nonhandicapped children. Some learning experts suggest more controversial treatments, including drugs called *amphetamines,* special diets, and exercises. Scientists are studying the effectiveness and safety of many of these methods. DIANNE SHIELDS

LEASE, *leese,* is a contract between a person who owns land or other property and a person who rents it from the owner. The person who grants the lease is called the *lessor.* The person to whom the lease is granted is called the *lessee,* or *tenant.* The compensation which the tenant agrees to pay the lessor is called the *rent.*

A lease for life ends when the tenant dies. A lease for a term of years begins and ends at dates set in the lease. The lease does not end when the tenant or lessor dies, but is binding on the heirs of both parties. Some leases are for a long period, such as 99 years. Such leases usually give the lessee greater privileges than those granted a short-term tenant.

Rents are generally paid in money, although occasionally they are paid in goods. For example, a person who rents a farm may agree to pay with crops.

A lease must include certain items of information to be a legal contract. These include the names of the lessor and tenant, the dates of the beginning and end of the lease, the amount of rent, a complete description of the property, and a complete statement of the rights and duties of each party. Most state laws provide that leases that cover a period of less than a year need not be written, but leases for a longer period must be in writing. Sometimes leases are prepared by the lessor's lawyer and the lessee's lawyer. WILLIAM TUCKER DEAN

See also CONTRACT; FIXTURE; RENT; TENANT.

LEASE, MARY ELIZABETH (1850-1933), was an American orator and reformer. She helped establish the Populist Party, a national political party (see POPULISM).

Lease was born in Ridgway, Pa. She moved to Kansas in 1870 and became active in the Farmers' Alliance movement there. Debt-ridden Midwestern farmers established the movement to protest against bank and railroad monopolies, and Lease forcefully voiced their complaints. In 1891, she worked with the Farmers' Alliance, the Knights of Labor, and other groups to form the Populist Party. Lease seconded the nomination of James B. Weaver for President at the party's nominating convention in 1892, and he became the Populist presidential candidate that year. She urged such Populist programs as government ownership of railroads and free coinage of silver (see FREE SILVER).

Brown Brothers
Mary Elizabeth Lease

Lease left the Populist Party in 1896 because it supported William Jennings Bryan, the Democratic candidate for President. She continued to work for women's right to vote and other reforms. Lease discussed her views on politics and reform in her book *The Problem of Civilization Solved* (1895). NANCY SPELMAN WOLOCH

LEATHER, *LETH uhr,* is specially treated animal skin from which all flesh and hair has been removed. The skin goes through a manufacturing process that makes it soft and flexible and prevents it from rotting. This process is called *tanning.*

People use leather in many different ways. About 80 per cent of all leather is used to make shoes. Belts, billfolds, gloves, and handbags are also made of leather. So are clothing and furniture. Leather is used for harnesses and saddles. Football players wear leather padding. Baseballs and some footballs and basketballs have leather covers. Leather belts are used on many types of motors and machinery.

All animal skins can be tanned. Most leather is made from cattle *hides* (skins). However, much leather is also produced from calfskin, sheepskin, pigskin, and goatskin. Manufacturers also make expensive leather from the skins of sharks and such reptiles as lizards, alligators, and snakes.

Human beings have known how to make leather for thousands of years. Cave men made clothing and coverings for their feet from leather that still had the hair on it. The ancient Egyptians made leather so well that pieces over 3,000 years old have been found perfectly preserved. The Egyptians also were skilled in dyeing leather in several colors.

North American Indians made a yellowish type of leather called *buckskin* from deerskins. They piled the skins in packs so the tissue surrounding the hair rotted off. They scraped the flesh from the inner side of the skin by hand, and pounded oil and the brains of animals into the skin. Then they let it hang in thick smoke. They produced good, soft leather.

Until the 1900's, most leather was made by hand in small tanneries. But increasing competition from artificial leather materials has forced tanneries to modernize. The synthetic materials look like leather. They are used chiefly to make shoes and other footwear. As a result, most tanneries now use many kinds of machines

that enable them to produce more finished leather with less labor and at less cost.

The United States is the world's leading leather producer. New York, Massachusetts, Tennessee, Missouri, and Maine are the leading leather-producing states in the United States.

Preparing Hides

All tanneries do not follow the same steps in processing hides to make leather. For example, some tanneries receive skins that have already been prepared for tanning. However, this article describes the processes used by most tanneries to produce leather from unprepared hides.

Soaking. The tannery usually receives hides that have been *cured*. That is, they have been salted, dipped in *brine* (salty water), or treated in some other way to prevent rotting. Tannery workers first soak the hides in water to soften them and to wash off all of the substances that were used to cure them. They may soak the hides from 2 to 48 hours. Then they wash the skins in tanks called *pits* or *paddle vats* to clean them.

Fleshing cleans off the inner side of the hides. Machines that are equipped with knives scrape the flesh and tissues from the inner side of the hide. The knives leave a clean, smooth surface on the hide.

Unhairing takes place in an area called the *beamhouse*. To remove the hair, workers soak the hides for from three to seven days in a tank containing lime and a small amount of sodium sulfide. They *mill* (stir) the hides in the tank each day. This soaking loosens the hair from the hides, and machines equipped with dull blades can easily scrape off the hair.

Hides must be refleshed after unhairing. The lime used in the unhairing process swells small particles of flesh that were not removed in the first fleshing operation and makes the flesh side of the skin rough. After the refleshing, workers called *beamsters* again *scud* the hides to remove the last bits of flesh and the hair roots.

The beamsters use a dull, curved knife that has a handle at each end to scrape the hide. The hide is stretched over a metal board that is curved in the same way as the knife. One end of the hide-covered board rests on the floor and the other end extends to the beamsters' waists. The beamsters draw the knife up the board toward themselves.

Hedrich-Blessing

A Leather Cutter in a shoe factory uses a sharp-edged form to cut pieces into the proper shape for the upper part of shoes.

Bating removes the lime from the hides, and makes the leather soft. The hides are washed again with cold water. Then they are placed in barrellike *vats* equipped with paddles. The vats are filled with warm water that contains *bating material*. Bating material consists of ammonium sulfate, ammonium chloride, or any other mineral that will eliminate the effect of the lime. It also contains an *enzyme*, a protein that softens the hide. The bating material enzyme is usually made from the pancreas of cattle.

Bating may last from 30 minutes to four hours. When it is finished, the hides are washed in cold water, removed from the vats and piled flat to allow the bating material to drain off. The bating process gives the *grain* (side from which the hair was removed) a silky feel. Leather that has been skillfully bated will usually have an excellent grain.

Tanning the Leather

Manufacturers use two tanning methods. These methods are (1) mineral tanning and (2) vegetable tanning. The method used depends on the intended use of the leather.

Mineral Tanning, also called *chrome tanning*, is chiefly used for tanning the leather that is used in the upper parts of shoes and other footwear. Chrome-tanned leather is also used for handbags and similar products. Grease- or wax-soaked chrome leather is used to make such machinery parts as hydraulic rams, pump gaskets, and oil seals.

The hides are *pickled* (soaked) in a solution of acid and common salt for from four to eight hours. Paddle wheels in the pickling tanks move the hides around. Pickling makes any lime that remains in the hides after bating ineffective. Pickling also draws moisture out of the hide. After pickling, the skins are taken out of the tanks and piled flat to drain for one or two days.

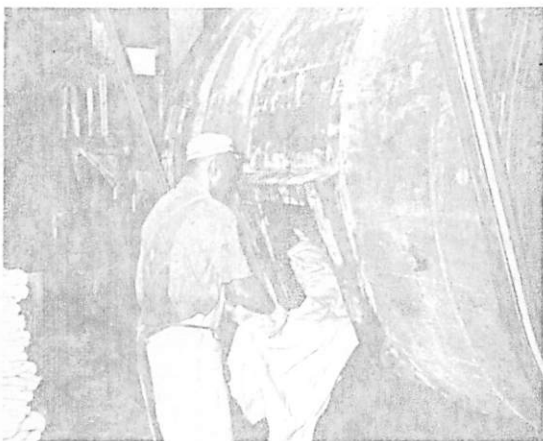
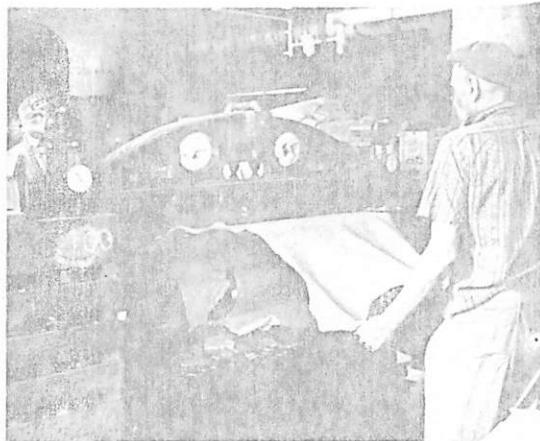
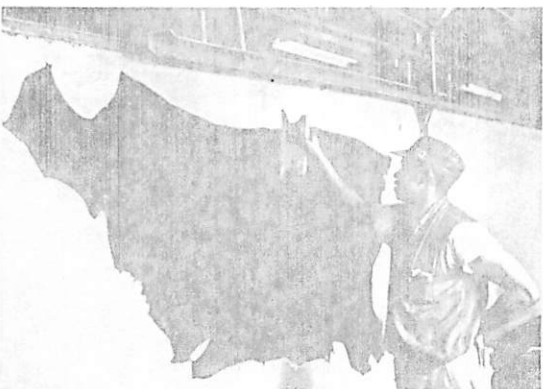
Two common methods of chrome tanning are the *two-bath method* and the *one-bath method*. Each produces a different kind of leather.

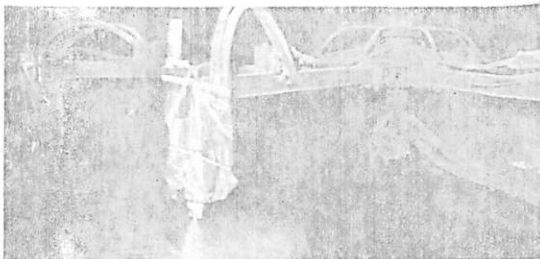
The Two-Bath Method. Workers put the pickled hides in a barrellike tanning drum that contains a solution of common salt, bichromate of soda, and acid. They stir the hides in this solution until the bichromate of soda has soaked in, then add more acid, and stir for another hour or more.

Workers add sodium thiosulfate then, and the hides are stirred for an additional two or three hours. Then the solution in the drum changes from an orange color to greenish-blue. The color changes because the bichromate of soda changes either to chromium sulfate or to chromium chloride, depending on the kind of acid used in the process.

Tanners then test the leather by boiling it. They consider it completely tanned if boiling does not damage it. The leather is then taken from the tanning drum and stacked in piles so the tanning solution can drain away.

Animal Hides usually are *cured* before shipment to tanneries. That is, they have been salted or dipped in *brine* (salty water) to prevent rotting before they are tanned. The materials used to cure them are washed off before tanning begins.

Hair Is Removed by a machine after the hides have been soaked in a lime solution. Stray bits of hair and flesh are scraped off by hand later.

The Tanning Drums are used to slosh the hides around in vegetable or mineral tanning solutions. After the tanning is completed, the hides go through machines that squeeze out the solution.

Some Tanned Leather Is Split and shaved to uniform thickness. It will be used for insoles and other articles for which thin leather is required. The leather may also be dyed various colors.

Leather Finishing includes several processes. The leather is stretched and dried on a board or special rack, *left*. Then several coats of finishing solution may be applied to the grain side, *below*. Between coats, it is rolled, glazed, and smoothed.

WORLD BOOK photos courtesy Wisconsin Leather Co.

[illegible] *Method* begins with a greenish-blue [illegible] *bichromate* of soda has already [illegible] sulfate or chromium chlo- [illegible] leather into a tanning drum with [illegible] the chrome solution and stir [illegible] from 5 to 15 hours. When the leather can with- [illegible] *boiling*, it is taken out of the drum and stacked so [illegible] *solution* can drain off.

Vegetable Tanning is used to tan heavy leather such [illegible] that used to make shoe soles, bags, cases, straps, harness, upholstery, linings, and belts for heavy industrial machinery. A bitter ingredient called *tannin*, or *tannic acid*, is used in vegetable tanning. Tannin is made from the leaves, nuts, bark, and wood of such trees and plants as the chestnut, hemlock, mangrove, oak, quebracho, sumac, and wattle. Manufacturers also make tannin from a brown sticky substance called *catechu*, or *cutch*. This substance comes from acacia plants.

Sole Leather. Several tannins are mixed and diluted with water, then placed in vats. The hides are attached to *cradles* or *rockers* in the vats that rock the hides slowly. The tanning solution at first is made very weak, containing 1 per cent tannin or less. Later, the vats are filled with stronger solutions until the *liquor* (solution) contains up to 4 per cent tannin. It may take 15 to 30 days for hides to pass through all stages from the weakest solution to the strongest. After they do, they are usually *struck through*. That is, the tannin has soaked through the entire cross section of the hide. The tanning liquors used in this process are called *rockers* or *handlers*.

Tanners then place the hides in still stronger tannin liquor. For 15 to 100 days, the liquors are strengthened at intervals to make up for the tannin that soaks into the hides. These liquors are called *layaways*.

After the hides are taken out of the layaway, they are thoroughly cleaned with water to remove all foreign substances. Then workers put them in tanning drums that contain concentrated tanning solution. This treatment increases the durability of the finished leather. From there, the hides go into a warm, strong tanning liquor for from three to five days for *tempering*. They are then piled flat to drain overnight. Then the hides are put through a wringer to remove all liquid.

Workers then *set* the hides by putting them through a machine that presses out the wrinkles and smooths the leather to a uniform evenness. Next, workers *bleach* (whiten) the leather by dipping it first in a weak alkaline solution, and finally in water.

After going through the wringer again, the hides are *stuffed*. Workers put the leather in a large rotating drum that is heated either with hot air or steam. Hot oils and greases are added to the drum as it rotates. The leather is dried, and then goes through the stuffing operation again.

The leather is rough and wrinkled after stuffing. Workers then pile it for from 5 to 10 days to *crust* (flatten). Then they *mull* it. That is, they dip the leather in water and hang it in a compartment filled with moisture for three or four days. The leather is then damp and quite flexible. After a liquid mixture of oil and wax is applied to the grained surface, the leather is rolled to compress the fibers and smooth the grained surface. Then it is hung to dry in a hot room or tunnel. When the leather is dry, the grained surface is polished.

Leading Leather-Manufacturing States and Provinces

Value added by manufacture in 1976

State/Province	Value
New York	[illegible]
Massachusetts	$344,200,000
Tennessee	$324,700,000
Missouri	$324,600,000
Maine	$268,400,000
Pennsylvania	$268,300,000
Louisiana	*
Ontario	$176,200,000
Wisconsin	$159,400,000
Quebec	$146,700,000

*The U.S. Bureau of the Census ranks Louisiana seventh among the states, but does not report its value added to avoid disclosing individual company data.
Sources: U.S. Bureau of the Census; Statistics Canada.

Bag, Case, Harness, and Strap Leather is treated in the same way as sole leather. But the total tanning time is much shorter, and different mixtures of tannin are used. After the leather is crusted, it is finished in a decidedly different manner.

Bag, case, and strap leather is split to the desired thickness. The split leather is used for various purposes, including low-priced luggage, belts, insoles for shoes, and other articles where a light, thin leather is desired. Harness leather is stuffed with a high percentage of oils and greases after crusting. Then the grain is finished and polished by hand. Upholstery leather is tanned in the same way as other leathers, and colored in the drums.

Lighter-weight leathers, such as calfskin and sheepskin, are tanned by the vegetable process. Sheepskins are usually tanned in a paddle vat or drum, and can be completely tanned in only a few hours. The chemical hexameta sodium phosphate is often used to speed the sheepskin tanning process. Hides are treated with this chemical after bating and can be fully tanned in seven hours. Calfskins can be tanned by this process in two or three hours. The heavy hides used for sole leather are tanned in from six to seven days.

Finishing the Leather

After leather has been tanned, solutions are allowed to drain off and the leather is sorted according to the different types of leather it will produce. After it is split and shaved to a uniform thickness, it is ready for the coloring operation.

Dyeing is done in a closed drum. After all soluble salts are washed away with warm water, the leather is dyed with combinations of aniline dyes, natural woody

Leading Leather-Manufacturing Countries

Value added by manufacture in 1976*

Country	Value
United States	$1,420,000,000
Russia	$1,409,100,000
West Germany	$759,000,000
Romania	$593,000,000
France	$503,500,000
Japan	$496,400,000
East Germany	$490,200,000
Great Britain	$345,800,000
Italy	$344,100,000
Spain	$287,500,000

*Based on International Standard Industrial Classification, which excludes footwear.
Source: Statistical Office of the UN.

dyes, acids, and a number of common tanning materials. It is nearly impossible to color leather with a single dye. From two to seven coloring materials may be needed to get a shade that is deep and lasting. There are about a hundred aniline dyes to use in coloring leather.

Dyeing may take from one to three hours. The leather is colored in the drum immediately after it is washed. The coloring matter, dissolved in the proper amount of water, is poured into the revolving drum.

Fat Liquoring is the process of treating the leather with oils or greases to make it flexible and strong. Many kinds of oil or grease soaps are used. Both hard and soft soaps are useful in fat liquoring. Leather soap fats must remain liquid at low temperatures.

The fat-liquoring operation usually takes less than an hour. The leather and soap are stirred in a drum, and the leather absorbs the oils and greases. At this stage, the leather readily absorbs the oils and greases. Workers must be careful not to use too much soap or the leather will be discolored. After fat liquoring, the leather is removed from the drum, drained, and placed in machines that remove excess water, iron out wrinkles, and press down the grain. Then it is hung up to dry.

The dried leather is piled up for from three to five days so it can absorb moisture from the atmosphere. After this, the leather is *sammied*. That is, it is dipped in warm water for a minute or two, then placed in damp sawdust which absorbs about 35 per cent of the moisture. This process takes about one or two days.

Tacking, Toggling, and Pasting stretch the leather and make it firm and flat. The leather may be tacked on a board or *toggled* (pinned) on a special frame that has holes in it. Tacked leather takes about 24 to 36 hours to dry. Toggled leather dries in about an hour. Sometimes leather is set and dried by *pasting*. Workers spread a mild paste on the grain side of the skin, then set the skin by hand on a smooth surface, usually lacquered paper cardboard supported on aluminum cores.

After the leather is dried and stretched, it is trimmed. Then it is ready for the final finishing process.

Final Finishing involves applying special liquid mixtures to the grain surface. The mixtures may include casein, shellac, blood serum, milk, gum tragacanth, flaxseed, Irish moss, *alphaprotein* (a soybean product), Japan wax, carnauba wax, candelilla wax, sulfated oil, pigments of all kinds, and aniline dyes. As many as seven coats of the finishing solution are applied to the finest kinds of finished leather. Between applications, machines roll, glaze, and smooth the leather.

Patent leather is produced by applying three coats of a heavy, oily varnish at the end of the finishing process. This gives it a high gloss.

JOHN MINNOCH

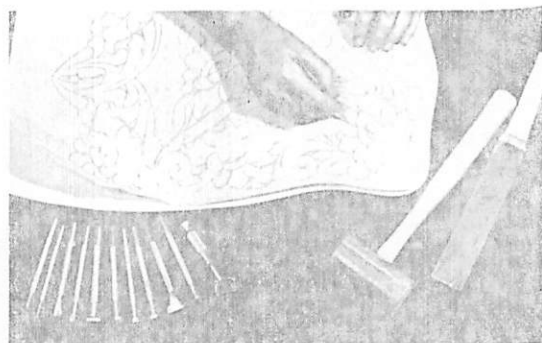
Related Articles in WORLD BOOK include:

Boyden, Seth	Crocodile	Shoe
Buckskin	Leathercraft	Suede
Chamois	Morocco (leather)	

LEATHERBACK. See TURTLE.

LEATHERCRAFT is the art of working with leather. As a hobby, it gives great satisfaction to both children and adults. Many simple leathercraft projects are sold in kit form. They include link belts, wallets, and key purses that children can put together easily. But such projects as hand-tooled, leather-topped tables challenge experienced craftworkers.

Many different kinds of leather are used in leathercraft work. Kits sold in hobby shops include the proper leather for the particular project. Leathercrafters who buy their leather in bulk frequently discuss their projects with hobby dealers to help decide which type of leather will be best for a particular purpose.

The simplest leathercraft kits are little more than leather lacing projects. These leathercraft kits help teach manual dexterity, but they do not require the use of tools. After perfecting a leather lacing technique, the hobbyist often decides to make a complicated wallet or

Leisure Crafts

A Leathercrafter uses several tools in decorating a piece of leather. Before carving a design into the leather, the craftworker traces the pattern on the leather with a ball-point stylus, above. A special swivel knife is then used to do the carving. Then, the leathercrafter uses a beveler to give the carved design a three-dimensional effect, *right*.

key case decorated with an interesting carved design.

Types. Many types of leather work may be made. *Flat modeling*, the simplest, is done by tracing a design on leather and pressing the background down with a tool. *Embossing* means creating a raised design by tooling the underside of the leather. *Cut-out designs* are attached to objects as decorations. *Carving* on heavy leather is much like wood carving. *Leather inlay designs* are made by pressing small pieces of leather onto a leather base. *Skiving* involves thinning or splitting leather to prevent bulging. *Burning* is done with an electric tool.

Tools. The *swivel knife* is the most important single leathercraft tool because it forms the basis of the total design worked into the leather. The *camouflage* is a crescent-shaped tool used primarily to give stems or flower petals a ruffled appearance representing small veins. The *shader* is a stamp tool with the working end shaped like a raindrop. It makes dish-shaped impressions in the designs. The *beveler* knocks down one side of each swivel knife cut to give a three-dimensional effect to the design. The *seeder* fills in the seed pods of flowers. The *mule's foot* is V-shaped, and makes dead-end cuts and decorates stems. Two general types of *background tools* are used. One taps the background down to the same depth as the swivel cuts. The other may be called a *matting tool* because it changes the texture of the area with a minimum of stretching. JACK WAX

See also PYROGRAPHY; EMBOSSING (picture).

LEATHERNECKS. See MARINE CORPS, UNITED STATES.

LEAVEN, *LEHV uhn*, is a substance that causes fermentation of dough in breadmaking. A leaven acts by causing the formation of carbon dioxide gas which bubbles through and lightens the batter or dough while it is baking. Yeast, sour milk and soda, and baking powder are common leavens.

See also BREAD (Kinds of Bread; History); YEAST.

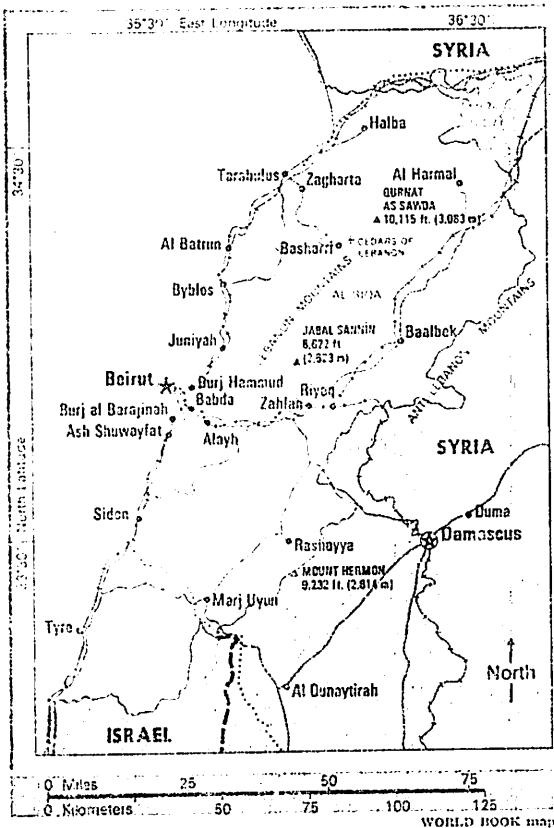
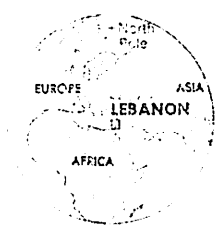
LEAVENWORTH, *LEHV uhn wurth*, Kans. (pop. 26,520), the oldest city in the state, is a distributing and manufacturing center. The city lies on the Missouri River about 30 miles (48 kilometers) northwest of Kansas City (see KANSAS [political map]). Its factories make furniture, batteries, cotton gloves, flour, mill machinery, and foundry and steel products.

Fort Leavenworth was established near the site of the city in 1827. For many years it was the most important army post on the western frontier. The U.S. Army Command and General Staff College is at Fort Leavenworth. Leavenworth Prison is also in the fort. The city is the home of St. Mary College. Leavenworth has a commission government. WILLIAM F. ZORNOW

LEAVENWORTH PRISON is one of the six federal penitentiaries in the United States. Its official name is United States Penitentiary, Leavenworth, Kans. It is on the Fort Leavenworth reservation on the Missouri River north of Leavenworth. Besides the buildings of the civil prison, a federal military prison also stands on the grounds. Leavenworth Prison was established in 1895. It has about 2,200 prisoners.

Critically reviewed by the BUREAU OF PRISONS

LEAVES. See LEAF.

LEBANON, *LEH buh nuhn*, is an independent nation in Asia, at the eastern end of the Mediterranean Sea. Lebanon is small—slightly smaller than the state of Connecticut. But it has been a world transportation and trade center for about 4,000 years. Beirut, the capital of Lebanon, is a gateway between Asia and Europe.

Lebanon is a mountainous land. Two mountain ranges cover much of the country. The country has a rich history. The cedars of Lebanon have grown on the mountain slopes since Biblical times. There are stony paths that Jesus once used, and the ruins of Phoenician ports, Roman temples, and castles built by the Crusaders still stand there.

Lebanon became independent in 1943. A bloody civil war spread throughout the country in the mid-1970's, causing tens of thousands of deaths, widespread destruction, and severe damage to the economy.

Government

Lebanon's legislature is called the Chamber of Deputies. The deputies elect the president to a six-year

Viola Hitti Winder, the contributor of this article, is the author of Land and People of Lebanon *and* Lands and Peoples (Lebanon).